

Master of Public Health Field Experience Report

FACTORS ASSOCIATED WITH BEHAVIORS IN RESPONSE TO HEALTH-RELATED MESSAGING FROM SHAWNEE COUNTY HEALTH DEPARTMENT: RESULTS OF A CASPER SURVEY

by

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submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

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Summary

The effectiveness of Shawnee County Health Department's (SCHD) "Dump Day" mosquito control campaign was evaluated using the Community Assessment for Public Health Emergency Response (CASPER) door-to-door survey method. The Dump Day campaign, which began during the summer of 2016, focused on emptying standing water on private property in effort to reduce mosquito breeding sites. CASPER is an epidemiologic technique designed to provide low cost, household based information about a community quickly and with limited resources. The primary objective of this project was to measure the effectiveness of SCHD's Dump Day campaign by assessing associated variables; age, routes of health-messaging uptake, and mosquito prevention methods practiced by the public. In addition, CASPER was used to determine if this method is a useful tool for SCHD to evaluate other programs and campaigns. The development of this CASPER closely followed the toolkit provided by CDC. Sampling was conducting in two stages; stage one entailed randomly selecting 30 clusters within Shawnee County and stage two encompassed randomly selecting seven households within each cluster. With 30 clusters selected with a goal of seven household selected a total of 210 households were selected for interview. Of those, 117 interviews were successfully completed and 43 refusals were documented. SCHD employees and MRC volunteers achieved a 55.7% completion rate, a 73.1% cooperation rate, and a 40.6% contact rate for this CASPER. This study revealed that for those who were aware of the Dump Day campaign dumped water on personal property. Also, individuals at high risk of WNV complications and death, those 65 years of age or older, were less likely to dump water on their property, use mosquito repellent, and consider mosquito control a public health issue. Households with children residing in them were more likely to use mosquito repellent and consider mosquitoes to be a nuisance on their property.

Subject Keywords: CASPER, Mosquito, Survey, Campaign

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Chapter 1 - Background

Field Experience Overview

I began my field experience on May 15, 2017 at the Shawnee County Health Department (SCHD) in Topeka, Kansas. My time at SCHD was facilitated by Ed Kalas, Division Manager of Environmental and Community Health. Mr. Kalas holds a Masters of Public Health degree from the University of Oklahoma as well as a registered sanitarian certification. Mr. Kalas manages the childcare licensing, communicable disease, and environmental health programs for Shawnee County.

The effectiveness of SCHD's "Dump Day" mosquito control campaign was evaluated using the Community Assessment for Public Health Emergency Response (CASPER) door-to-door survey method. The Dump Day campaign, which began during the summer of 2016, focused on emptying standing water on private property in effort to reduce mosquito breeding sites. A Dump Day reminder was sent out weekly on Facebook® and Twitter®.

CASPER is an epidemiologic technique designed to provide low cost, household based information about a community quickly and with limited resources. A toolkit was developed to assist personnel in conducting rapid needs assessments to determine the needs or knowledge, attitudes, and practices of a community in a low-cost manner. While originally designed for disaster response, it has been utilized in recent years in non-disaster settings.¹¹

The Shawnee County Health Department requested that I become a Medical Reserve Corps (MRC) volunteer. MRC is an organization made up of local volunteers to improve the health and safety of their communities.¹ These volunteers participate in various community activities including influenza vaccination clinics, drug take back events, health fairs, and preparedness drills. I completed necessary incident command system modules and psychological first aid trainings as part of the MRC volunteer requirements. In addition, I attended two quarterly MRC meetings to promote my

capstone project and recruit volunteers for assistance. I also assisted with a Dump Day booth at the Shawnee County Fair held on July 20 – July 23, 2017.

This project was completed to fulfill the requirements of the Masters of Public Health program at Kansas State University. The objective of this program sought to prepare students to better address issues on local, state, national and international levels. I first completed the Graduate Certificate in Public Health Core Concepts in 2016 and then continued on to obtain the Master of Public Health degree. The degree program requires 42 graduate credit hours including five core competencies: biostatistics, epidemiology, environmental health, health services administration, and social and behavioral sciences. All of these courses provided me with the framework to successfully complete my field experience.

West Nile Virus

Arthropod-borne viruses (arboviruses) are transmitted to humans primarily through bites of infected mosquitoes and ticks. West Nile virus (WNV) is the leading cause of domestically acquired arboviral disease in the United States.² In addition to mosquito exposure, humans can contract WNV through blood transfusions, organ transplants, laboratory exposures, or from mother to baby during pregnancy, delivery, or breastfeeding. WNV cycles between mosquitoes (principal vector *Culex* species) and birds. When mosquitoes bite infected birds, they can pass the virus on to people, horses, and other mammals. These are all considered to be “dead-end” hosts since they do not develop high enough levels of virus in their bloodstream to pass the virus back to biting mosquitoes.³

The incubation period of WNV is usually two to six days but can range from two to fourteen days.⁴ Approximately 80% of individuals who are infected with WNV are asymptomatic.⁴ The remaining 20% of infected persons will develop an acute systemic febrile illness that may include headache, weakness, myalgia, or arthralgia.⁴ Furthermore, some will experience gastrointestinal symptoms and a maculopapular

rash.⁴ Less than 1% of WNV infections result in neuroinvasive disease which may present as meningitis, encephalitis, or acute flaccid paralysis.⁴ Persons over age 50 and immunocompromised individuals are at higher risk for severe disease and death due to weakened immune systems.⁵

From 1999-2015, there were a total of 43,937 cases of WNV in the United States; 1,911 resulted in death. Since WNV became a reportable disease in Kansas in 2002, 457 cases of WNV were reported to the Kansas Department of Health and Environment (KDHE).⁶

Mosquito Life Cycle

Mosquitoes go through four distinct stages during their life cycle: egg, larva, pupa, and adult. The adult female lays her eggs at one time in a raft that floats on the surface of water. Most eggs will hatch into larvae within 48 hours. The larvae live in water and float at the surface to breathe oxygen. The larvae will shed its skin four times; the fourth time, the larvae will change into pupae. The pupal stage is a resting, non-feeding stage of the life cycle. This stage can be compared to the cocoon stage that a caterpillar enters before turning into a butterfly. The pupal skin will eventually split allowing the adult mosquito to emerge.⁷ This process usually takes up to two weeks but depending on conditions such as temperature, it can be completed in as little as four days.⁸ Water is essential in this life cycle and understanding this life cycle is critical for effective mosquito control.

Mosquito Control and Prevention

The most effective way to protect yourself from WNV is to avoid mosquito bites. The Centers for Disease Control and Prevention (CDC) recommends using insect repellent approved by the Environmental Protection Agency (EPA) to prevent WNV infection. Repellents should contain DEET, picardin, IR3535, oil of lemon eucalyptus, or 2-undecanone as an active ingredient for best protection.⁹ Also, CDC encourages individuals to wear long-sleeved shirts and long pants when weather permits.

In addition to personal protection, there are other recommended prevention measures people can utilize around the home to control mosquito exposure. Ensure screens are in good repair or use a mosquito net when screens are not available. Empty items that can collect water once a week as it can reduce the number of mosquito breeding sites. This disrupts the mosquito life cycle by killing the mosquito before it can emerge as an adult. Items that should be emptied include tires, buckets, birdbaths, kids' toys, planters, and others.⁷ For areas with standing water that cannot be dumped, larvacide may be used to control mosquitoes. Larvacide is used to kill immature mosquitoes before they emerge as adults. Many larvacides contain *Bacillus thuringiensis israelensis* (BTI) which is a naturally occurring bacterium found in soils that produces crystal proteins that have insecticidal action is not harmful to humans or other animals.¹⁰ Adulticide is designed to kill adult mosquitoes but should only be used in outbreak situations.

Project Objective

The primary objective of this project was to measure the effectiveness of SCHD's Dump Day campaign by assessing associated variables: age, routes of health-messaging uptake, and mosquito prevention methods practiced by the public. In addition, CASPER was used to determine if this method is a useful tool for SCHD to evaluate other programs and campaigns. This project aimed to examine health prevention measures taken by different age groups and assess the best ways to reach Shawnee county residents with health messages.

Chapter 2 - Methods

CASPER Development and Data Acquisition

The development of this CASPER closely followed the toolkit provided by CDC. Sampling was conducting in two stages; stage one entailed randomly selecting 30 clusters within Shawnee County and stage two encompassed randomly selecting seven households within each cluster. Thirty clusters and seven households within each cluster is the standard set by the CASPER guidance.

During first stage sampling, a comprehensive list of all census blocks in Shawnee County was obtained from the U.S. Census Website (<http://factfinder2.census.gov>). Census 2010 summary data was used to collect this data with occupancy status and total population variables. Census blocks were used as the clusters for this Casper since they are pre-defined and non-overlapping. Thirty clusters were selected with their probability proportional to the estimated number of housing units in each cluster. Microsoft® Excel 2016 was used to randomly select the clusters. The cumulative number of households per census block was calculated and a random number generator was used to select 30 numbers between one and the total sum of all household units. Each selected random number was matched to the corresponding cumulative number of households per census block. Matched census blocks were used for this study.

Maps of the 30 randomly selected clusters (census blocks) were created using U.S. Census Bureau – TIGERweb software (Figure 1). Maps were then enhanced by creating a Google® Earth image so individual households could be easily identified. Systematic random sampling was used to identify seven households in each cluster by taking the number of households in that cluster and dividing by seven. Every n th house was preselected on the maps starting at the top left corner of the map and working clockwise in a serpentine method until seven households were circled (Figure 2). A comprehensive map of all selected clusters in Shawnee County was developed to aid in assignments to survey volunteers (Figure 3).

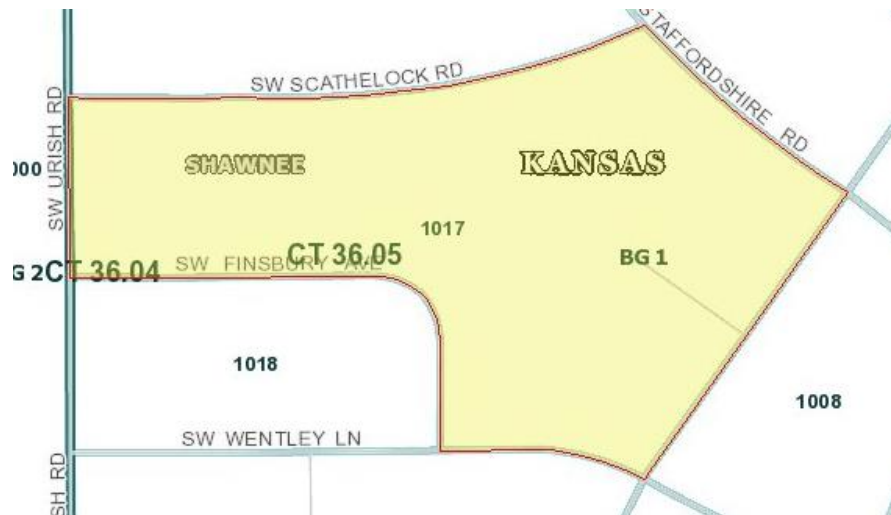


Figure 1: TIGERweb Cluster 5 Map

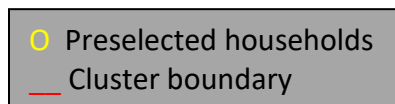
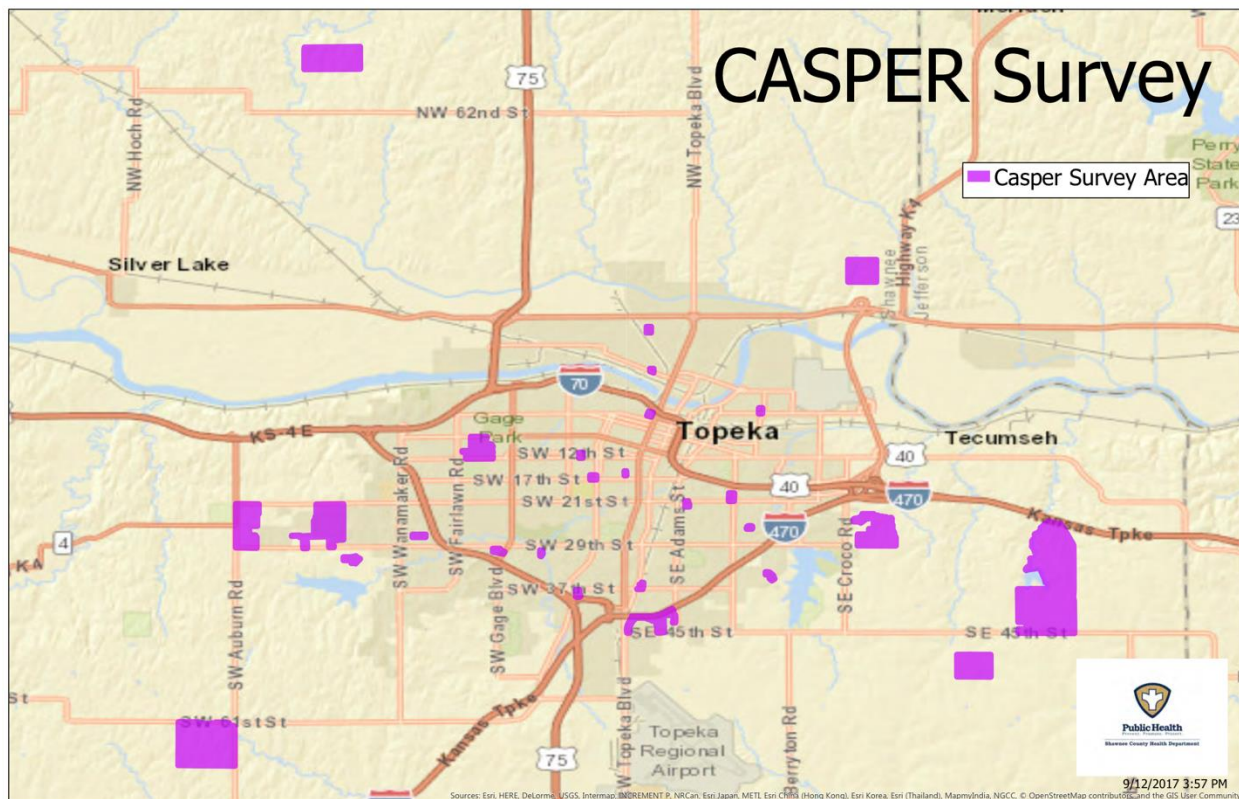


Figure 2: Google® Earth Cluster 5 Map




 Selected Census Blocks

Figure 3: Comprehensive Cluster Map of Selected Census Blocks

CASPER volunteers were instructed to attempt to survey the preselected households at least two times before moving to the adjacent household. If the person who answered the door was not eligible to complete the survey or they refused, the volunteers were instructed to move to the next household in a clockwise manner. A interviewee was considered to be eligible if they were 18 years or older and resided in the household. All attempts, refusals, and completed interviews were recorded on provided tracking sheets (Appendix 1).

SCHD planned to complete the CASPER using up to 20 MRC volunteers. An informative presentation about this CASPER was provided at two MRC quarterly meetings, June 20 and August 25, 2017 in effort to recruit survey volunteers. A media release was sent out by SCHD on September 13 to alert the public a door-to-door

survey may be occurring in their neighborhood. A just-in-time training was given to volunteers before surveying on September 19. This training provided instructions on CASPER methodology, directions for selecting replacement houses in the case of refusal or unable to interview after two attempts, a tutorial on how to complete forms appropriately, and tips for a successful interview.

A 22 question anonymous survey was developed for this CASPER, which included an initial script for survey volunteers that explained reason for the survey, its anonymity, and that responses were confidential. The survey consisted of questions assessing household socioeconomic status, awareness of the Dump Day campaign, prevention measures taken to prevent mosquito exposure, method of receipt for health news, and potential exposure to mosquitos (Appendix 2). A reference sheet was utilized with categorical options for household income and educations level. Examples of adulticide and larvacide were also on this reference sheet to prompt the respondent. After the survey was completed, the volunteers educated the respondent on larvacide use and offered a free sample and instructions from SCHD.

Volunteers surveyed selected clusters in teams of two on September 19, 20, 26, 27, 29, and 30, 2017. Surveyors included eight MRC volunteers and five SCHD employees. The most number of teams on any survey day was four, and teams were required to notify the team lead upon arrival and departure from each cluster for security purposes.

Data Analysis

All survey data was entered into Microsoft® Excel 2016 to be imported to SAS® 9.3 for data analysis. The completion rate was calculated by dividing the number of completed interviews by the goal set for the number of households to be interviewed. The cooperation rate was calculated by dividing the number of completed interviews by all contacts made (interviews completed, incomplete interviews, and refusals). The contact rate was calculated by dividing the number of completed interviews by all attempts (interviews completed, incomplete interviews, refusals, and non-respondents).

Categories were collapsed for the following variables: adults 65 years and older in a household, children in a household, health news frequency, dump weeks, mosquito repellent, mosquito nuisance, social media use, education, and income into yes or no responses. Data was weighted by dividing the total number of housing units in the sampling frame by the number of house units interviewed with the cluster multiplied by the number of clusters selected. This ensured every cluster was weighted equally. Bivariate analysis was conducted to identify factors associated with knowledge of dump day. Relative risks, 95% confidence intervals, and p values were calculated.

Table 1: Collapsed Variables

Variable	Responses	Collapsed Response
Adults 65 years and older in a household	0	No
	1	Yes
	2	
	3	
	4	
	5 or more	
Children in a household	0	No
	1	Yes
	2	
	3	
	4	
	5 or more	
Health news frequency	Daily	Frequent
	Weekly	
	Monthly	Not Frequent
	Quarterly	
	My household does not seek out or follow health news	
Dump weeks	None	Did not dump water
	1-4 Weeks	Dumped water
	5-8 Weeks	
	9-12 Weeks	

	12 or more weeks	
Mosquito repellent	Less than once a week	Did not wear repellent
	1-2 times a week	Used repellent
	3-4 times a week	
	5 or more times a week	
Mosquito nuisance	Yes	Yes
	No, property has mosquitoes, not a nuisance	No
	No, do not notice mosquitoes	
Social media use	Facebook	Yes
	Twitter	
	Both	
	None	No
Education	Less than 9th grade	High school degree or less
	9-12th grade, no diploma	
	High school graduate	
	Associates or Vo-tech	More than high school degree
	Some college (no degree)	
	Bachelor's degree	
	Graduate or professional	
Income	Less than \$14,999	Less than \$50,000
	\$15,000 to \$24,999	
	\$25,000 to \$34,999	
	\$35,000 to \$49,999	
	\$50,000 to \$74,999	More than \$50,000
	\$75,000 to \$99,999	
	\$100,000 or more	

Survey data collected was analyzed to generate estimates for all persons who reside within Shawnee County.

Chapter 3 - Results

Response Rate

With 30 clusters selected with a goal of seven household selected a total of 210 households were selected for interview. Of those, 117 interviews were successfully completed and 43 refusals were documented. SCHD employees and MRC volunteers achieved a 55.7% completion rate, a 73.1% cooperation rate, and a 40.6% contact rate for this CASPER.

Dump Day Campaign Effectiveness

The overall research question for this CASPER was how effective was the Dump Day campaign. SCHD sought to determine how many Shawnee County residents were aware of the campaign and if they actually dumped water on their property in response to the campaign. The results indicated that those were aware of the campaign were 1.92 times as likely to dump water as those who were not aware of the campaign. This finding was statistically significant. Households with adults over the age of 65 years or households with children were neither more nor less likely to be aware of the campaign (Table 2). Education level and household income were not statistically significant in determining dump day campaign effectiveness.

Table 2: Variables Associated with Dump Day Campaign Awareness

Variables	Weighted Frequency	Weighted Percentage (%)	Relative Risk (95% CI)	P-value
Dump Day Awareness by Dumping Standing Water Amongst All Age Groups	10768	15.6	1.92 (1.30-2.83)	0.0032*
Adults Over 65 years by Dump Day Awareness	4917	7.4	0.66 (0.29-1.50)	0.2842
Households with Children by Dump Day Awareness	7151	10.9	1.68 (0.78-3.60)	0.1696

**statistically significant*

If the respondent replied they were aware of the campaign, they were then asked how they heard of about it. The most common method of hearing about the campaign was Facebook (40.6%) followed by news or radio (26.2%), Twitter (11.9%), the Shawnee County Fair (3.8%), and other or don't know (9.0%) (Table 3).

Table 3: Method of Hearing about the Dump Day Campaign

Method	Weighted Frequency	Weighted Percentage (%)
Facebook	7177	40.6
News/Radio	4667	26.4
Twitter	2113	11.9
Shawnee County Fair	672	3.8
Other	1056	6.0
Don't Know	538	3.0

High Risk Group Behaviors

Surveillance has shown elderly individuals are at greater risk for complications and death from WNV infection, therefore, mosquito prevention behaviors were analyzed for households who had at least one adult aged 65 years or older (Table 4). Households with an adult aged 65 years or older were 0.52 times as likely as households without an adult aged 65 years or older to dump standing water on their. In addition, these households were 0.80 times as likely to consider mosquito control a public health issue as households without an elderly individual and 0.49 times as likely to consider mosquitoes to be a nuisance on their property. Lastly, households with adults 65 years or older were 2.91 times as likely to not use social media. All of these findings were statistically significant.

Table 4: Variables Associated with Households with an Adult 65 Years or Older

Variables	Weighted Frequency	Weighted Percentage (%)	Relative Risk (95% CI)	P-value
Adults Over 65 and Mosquito Repellent Use	10467	16.94	0.67 (0.40-1.13)	0.1154
Adults Over 65 years who Dump Standing Water	8054	12.13	0.52 (0.29-0.96)	0.0203*
Adults Over 65 years who Consider Mosquito Control a Public Health Issue	21185	31.51	0.80 (0.62-1.04)	0.0104*
Adults Over 65 years who Consider Mosquitoes a Nuisance on Their Property	9283	13.81	0.49 (0.30-0.81)	<0.0001*
Adults Over 65 years who Seek Out Health News at Least Weekly	21185	33.52	1.07 (0.80-1.45)	0.6262
Adults Over 65 years who Do Not Use Social Media	10999	16.55	2.91 (1.35-6.32)	0.0001*

**statistically significant*

Households with Children Behaviors

Evaluation of mosquito prevention behaviors were also assessed for households who have children living in them. Households with children were 1.69 times as likely to use mosquito repellent and 1.75 times as likely to consider mosquitoes to be a nuisance on their property than those without children (Table 5). When children are present in the household, that household is 2.98 times more likely to use social media than when children are not present. These findings were statistically significant.

Table 5: Variables Associated with Households with Children

Variables	Weighted Frequency	Weighted Percentage (%)	Relative Risk (95% CI)	P-value
Households with Children and Mosquito Repellent Use	17407	28.60	1.69 (1.28-3.00)	0.0014*
Households with Children who Dumping Standing Water	13131	20.06	1.40 (0.75-2.61)	0.2802
Households with Children who Consider Mosquito Control a Public Health Issue	23009	34.70	1.16 (0.96-1.41)	0.0658
Households with Children who Consider Mosquitoes a Nuisance on Their Property	17433	26.30	1.75 (1.14-2.67)	0.0022*
Households with Children who Seek Out Health News at Least Weekly	19994	31.91	1.08 (0.83-1.41)	0.5207
Households with Children who Use Social Media	1953	2.98	0.24 (0.07-0.86)	0.0028*

**statistically significant*

Personal Property Factors

Lastly, households who consider mosquitoes to be a nuisance on their property are 2.19 times more likely to dump water than households who do not consider mosquitoes to be a nuisance (Table 6). This result is statistically significant.

Table 6: Variables Associated with Personal Property Behaviors

Variables	Weighted Frequency	Weighted Percentage (%)	Relative Risk (95% CI)	P-value
Households who Consider Mosquitoes a Nuisance who Dump Water on Their Property	21985	31.46	2.19 (1.20-4.01)	0.0009*

**statistically significant*

Health Messaging

This survey evaluated the preferred method of receiving health news. While households with an adult aged 65 years or older preferred to receive the majority of their health news by television or newspaper, households without an adult aged 65 years or older preferred internet, television, email, or social media. Limited education level and household income information was available. The data we had did not show significant associations in seeking out health news.

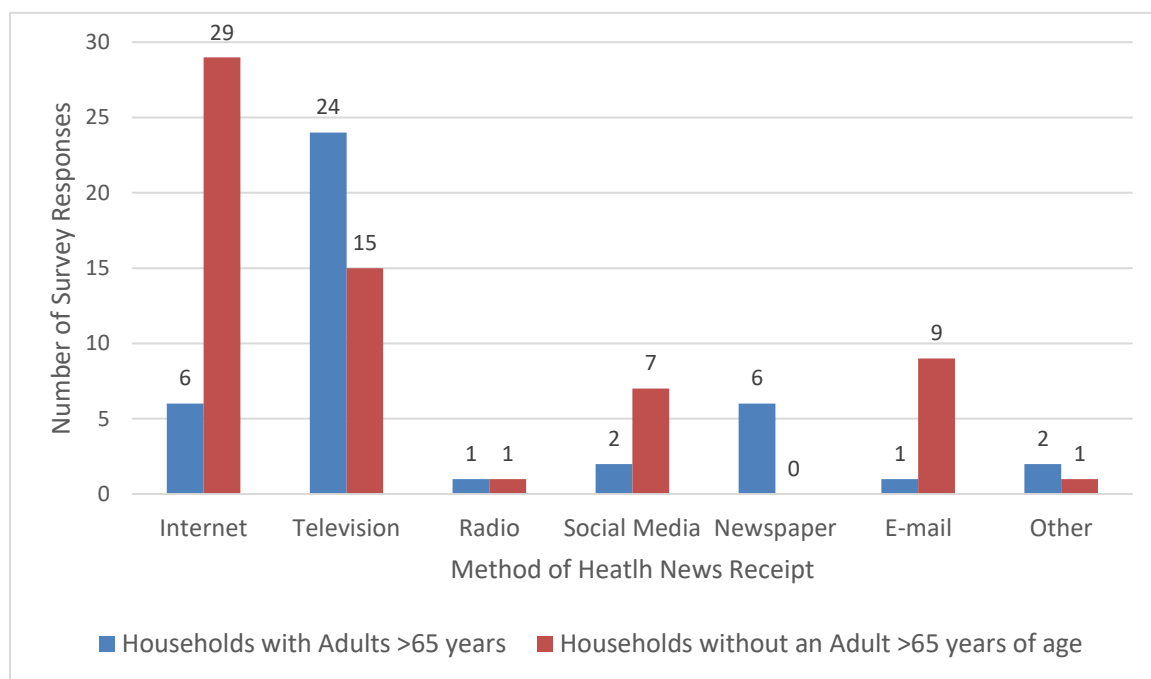


Figure 4: Method of Preferred Health News Receipt by Age Group, n=116

Chapter 4 - Conclusions and Discussion

This CASPER sought to determine the effectiveness of the Dump Day campaign. Additionally, it was used to determine if CASPER is a good tool that SCHD can use to evaluate other campaigns and programs. This study revealed that for those who were aware of the Dump Day campaign dumped water on personal property. Also, individuals at high risk of WNV complications and death, those 65 years of age or older, were less likely to dump water on their property, use mosquito repellent, and consider mosquito control a public health issue. Household with children residing in them were more likely to use mosquito repellent and consider mosquitoes to be a nuisance on their property.

Adults aged 65 years or older were less likely to know about the campaign and dump water on their property may be due to the majority of the advertising being on Facebook and Twitter. This age group were less likely to use social media and preferred to receive their health news through television and newspaper. This may explain why this age group was less likely to have acted on the campaign or engaged in mosquito prevention measures since the majority of the campaign advertisement was on Facebook and Twitter. This trend is also reflected in an article examining implications of social media use on health information technology. Individuals aged 65 years and older were less likely to visit social media platforms for any reason.¹³

Several limitations were noted in this study. First, the limited number of volunteers made it extremely difficult to reach the goal of 210 households. Due to a vacant cluster of mobile homes and 3 clusters with 11 households or less, the completion rate suffered. Only 200 households were available for surveying. In addition, a tight deadline was required to give adequate time for data analysis and report writing. Door-to-door surveying presented its own challenges of unresponsiveness, unwillingness to open doors, and physical limitations for some volunteers. This survey was done in September when sunset occurs around 7:30 pm. It was difficult to reach residents when they were off work and before the sunset. 2010 Census data was used to select clusters. Household occupancy may have changed between 2010 and 2017 as one cluster was determined to an abandoned mobile home park which hurt the

completion rate. Education and income level questions were not routinely answered as some interviewees did not feel comfortable asking the questions or the respondent refused. Analysis could not be performed on those factors.

Amongst these limitations, this CASPER had many accomplishments. A 55.7% completion rate was achieved with very few volunteers. Pre-selecting houses on maps helped volunteers complete clusters more quickly as they did not have to determine those on site. The questionnaire was short enough to encourage participation but long enough to collect pertinent information for analysis. In addition to gathering survey data, SCHD used this CASPER as an outreach opportunity. Interview respondents were provided with larvacide and education materials about mosquito prevention.

Overall, CASPER is a good tool to evaluate other campaigns and programs at SCHD with the caveat of requiring additional resources. More volunteers and a larger surveying timeframe will be needed in future CASPERs to achieve the goal of 210 households. While conclusions were able to be drawn from limited data in this CASPER, a larger sample size would increase the power of the results. In addition, SCHD's geographic information system specialist has the capacity to create detailed maps that are crucial for a successful CASPER.

Recommendations for the Dump Day campaign include targeting high risk groups by advertising through television and newspaper since these are preferred methods of receiving health news. Issuing media releases about dumping water in addition to social media reminders throughout the campaign may reach high risk groups. Lastly, including other mosquito prevention measures should be added to the Dump Day campaign.

Future Plans

A CASPER report will be submitted to SCHD. In addition, a presentation will be given to stakeholders to describe the challenges and successes in this type of survey.

Chapter 5 - Core Area Competencies

My emphasis in the degree program was infectious disease and zoonoses. This path was chosen due to my previous work experience at the Kansas Department of Health and Environment (KDHE) as a medical investigator in the Bureau of Epidemiology and Public Health Informatics. At KDHE, my focus areas are influenza and West Nile virus, therefore, a field experience focusing on vector borne disease was a natural fit.

Biostatistics

Biostatistics provided me with the framework to analyze the data collected during my field experience. Calculating relative risk and significance was essential for determining the effectiveness of the campaign.

Environmental Health Sciences

This course emphasized the need to look at the entire health triad when addressing a public health issue. My field experience focused on environmental prevention measures that can be taken to reduce the risk of human illness.

Epidemiology

Epidemiology introduced me to important concepts to analyze the data collected during my field experience. It proved helpful when determining the relationship between variables collected in my field experience and how to interpret them.

Health Service Administration

This course described the complexity of the health care system and the organization of local, state, and federal health departments. One of the main purposes of my project was to justify the need to continue with the Dump Day campaign and invest in similar campaigns. It is important to present your findings to stakeholders to continue programs.

Social and Behavioral Health

Social and behavioral sciences improved my ability to craft a questionnaire that carefully probed for accurate answers to sensitive questions. Education level and household income questions were included on the questionnaire to help assess potential economic barriers to personal mosquito prevention.

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Appendix 1 – Tracking Sheet

ASSESSMENT TRACKING FORM

Cluster # (i.e., 1-30): _____ # of Houses in Cluster: _____ Interviewer: _____ Date: ____/____/____

Instructions: Use one tracking form per cluster. Check where appropriate, but try to choose only one best option for each of the five categories. Go as far down the list as possible for each site you visit.

Sampled Housing Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Type of Dwelling																	
Single Family Home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mobile Home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Apartment or Condo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Answer																	
Door was answered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nobody home after 1 st visit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nobody home after 2 nd visit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nobody home after 3 rd visit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interview																	
Language Barrier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Refused to Participate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interview begun, not finished	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interview completed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Survey # (i.e. 1-7) from completed questionnaire																	

Appendix 2 – Questionnaire

Hello, I am _____ and this is _____. We are talking to residents in Shawnee county about mosquito prevention and Shawnee County Health Department's "Dump Day" campaign. Your household is one of many that have been randomly chosen to be in this survey. If you agree to participate, we will ask you some general questions about your household and the people who live there and questions about your household's mosquito prevention practices. The survey should take no more than 15 minutes to complete. We will keep your answers private. You can refuse to be part of the survey or refuse to answer any of the questions. Nothing will happen to you or your household if you choose not to be part of the survey. You may have questions about this survey. If so, you can ask anyone here right now. If you would like to confirm that we were sent by the Shawnee County Health Department you can call Ed Kalas at (785) 806-1520.

We are only interviewing adults 18 years and older. Are you 18 years or older? (If no, ask if you can speak to someone who is 18 years or older. If no one is available, stop the survey here and thank the person for his or her time)

Do you reside at this property? (If no, ask to speak with someone who does reside there. If no one is available, stop the survey here and thank the person for his or her time.)

Are you willing to participate?

If yes: Thank you. (Begin survey)

If no: Thank you for your time. (Proceed to the next in sampling and try again)

If there is anything that we ask or say that you do not understand, or you would like further explanation about any item, please do not hesitate to ask.

Date (MM/DD/YY): ____/____/____ Team Number: _____

Cluster Number: _____ Survey Number: _____

Interviewer initials: _____

1. What language is spoken most often in your home?

- ☐ English ☐ Don't Know
☐ Spanish ☐ Refused/No Answer
☐ Other: _____

2. How many adults (18 years old or older) live in this household?

- ☐ 1 ☐ 5 or more
☐ 2 ☐ Don't Know
☐ 3 ☐ Refused/No Answer
☐ 4

3. How many adults are 65 or older?

- ☐ 1 ☐ 5 or more
☐ 2 ☐ Don't Know
☐ 3 ☐ Refused/No Answer
☐ 4

4. How many children (younger than 18 years old) live in this household? (Only include children who reside at the household 50% or more of the week.)

- ☐ 1 ☐ 5 or more
☐ 2 ☐ Don't Know
☐ 3 ☐ Refused/No Answer
☐ 4

5. Have you or anyone in your household heard about Shawnee County's "Dump Day" Campaign? This campaign is meant to remind the public to empty standing water on their property every Friday from May through October.

- ☐ Yes
☐ No
☐ Don't Know
☐ Refused/No Answer

(If no, don't know, or refused skip to question 6)

5a. How did your household hear about the "Dump Day" campaign? (Check all that apply)

- ☐ Facebook ☐ News/radio
☐ Twitter ☐ Shawnee County Fair (July 20-23)

- ☐ From a friend/relative
☐ Other: _____
☐ Don't Know ☐ Refused/No Answer
6. How does your household prefer to receive the majority of its health news? (Check all that apply. If more than one are mentioned, ask participant to rank up to 3. 1=Most preferred 3=Least preferred)
- ☐ Internet ☐ Newspaper
☐ Television ☐ E-mail
☐ Radio ☐ Other: _____
☐ Social Media ☐ Don't Know
☐ Refused/No Answer
7. How often does your household seek out or pay attention to health news?
- ☐ Daily ☐ My household does not seek out
☐ Weekly or follow health news
☐ Monthly ☐ Don't Know
☐ Quarterly ☐ Refused/No Answer
8. How many weeks between May 21, 2017 and September 15, 2017 (18 weeks) did you or a member of your household dump water on your property?
- ☐ None ☐ 12 or more weeks
☐ 1-4 weeks ☐ Don't Know
☐ 5-8 weeks ☐ Refused/No Answer
☐ 9-12 weeks
- (If water was dumped at least 1 week, proceed to question 8a)
- 8a. Did your household dump water in response to the "Dump Day" campaign?
- ☐ No, was not aware of the campaign
☐ No, dumped water but not because of the campaign
☐ Yes, dumped water in response of the campaign
☐ Don't Know ☐ Refused/No Answer
9. On average, how many times per week in the last 3 months have you or the members of your household used mosquito repellent?
- ☐ Never ☐ 5 or more times a week
☐ Less than once a week ☐ Don't Know
☐ 1-2 times a week ☐ Refused/No Answer
☐ 3-4 times a week
10. On average, how many hours per week do you or the members of your household spend outdoors at your property?
- ☐ Less than 1 hour ☐ 8 or more hours
☐ 1-4 hours ☐ Don't Know
☐ 4-8 hours ☐ Refused/No Answer
11. What parts of day are you or the members of your household outdoors at your property? (Hand them list)
- ☐ Early morning (5:00 AM – 8:00 AM)
☐ Late morning (8:00 AM – 12:00 PM)
☐ Afternoon (12:00 PM – 4:00 PM)
☐ Early Evening (4:00 PM – 7:00 PM)
☐ Late Evening (7:00 PM – 11:00 PM)
☐ Overnight (11:00 PM – 5:00 AM)
☐ Don't Know
☐ Refused/No Answer
12. Do you or other members of your household consider mosquitoes to be a nuisance around this property?
- ☐ Yes
☐ No, my property has mosquitoes but my household does not consider them to be a nuisance
☐ No, my property does not notice mosquitoes
☐ Don't Know
☐ Refused/No Answer
13. How important is mosquito control and prevention as a public health issue on your property to your household?
- ☐ Not important at all ☐ Don't Know

- ☐ Somewhat important ☐ Refused/No Answer
☐ Very important
14. Is there standing water on your property that cannot be dumped (ex ditches, ponds without fish, etc.)?
- ☐ Yes ☐ Don't Know
☐ No ☐ Refused/No Answer
15. Does your household use any product designed to kill mosquitoes on your property?
- ☐ Yes ☐ Don't Know
☐ No ☐ Refused/No Answer
 (If no or don't know, skip to question 16)
- 15a. What products does your household use?
- ☐ Adulticide (spray) to kill adult mosquitoes, ex. Cutter Backyard Bug Defense, Advantage II Yard and Premise Spray)
☐ Larvacide (applied to water to kill mosquitoes at larvae stage, ex. Mosquito Dunks, Mosquito Bits)
☐ Other: _____
☐ Refused/No Answer
16. If your household was provided larvacide (product used in standing water that cannot be dumped to reduce mosquito breeding sites), would you or a member of your household use it on your property?
- ☐ Yes ☐ Don't Know
☐ No ☐ Refused/No Answer
 (If yes, don't know, or refused, skip to question 17)
- 16a. Why not?
- ☐ Believes larvacide is harmful to health of humans or animals
☐ Does not think it is necessary
☐ Other: _____
☐ Don't Know
☐ Refused/No Answer
17. What day(s) of the week would the Dump Day reminder be the most useful to remind your household to dump standing water on your property? (Check all that apply)
- ☐ Sunday ☐ Thursday
☐ Monday ☐ Friday
☐ Tuesday ☐ Saturday
☐ Wednesday ☐ Don't Know
☐ Refused/No Answer
18. Do you or does anyone in your household use the following social media platforms? (Check all that apply)
- ☐ Facebook ☐ Don't Know
☐ Twitter ☐ Refused/No Answer
☐ None
 (If no or don't know, skip to question 19)
- 18a. What social media platforms do you or any member of this household follow Shawnee County Health Department on? (Check all that apply)
- ☐ Facebook ☐ Don't Know
☐ Twitter ☐ Refused/No Answer
☐ None
19. How interested are you in following the Shawnee County Health Department on any social media platform?
- ☐ Not interested ☐ Don't Know
☐ Somewhat interested ☐ Refused/No Answer
☐ Very interested
20. How likely are you or the members of your household to act on a public health recommendation, such as vaccinating your children, dumping standing water in your yard, or making sure your childcare is licensed from the Shawnee County Health Department?
- ☐ Not likely ☐ Don't Know
☐ Somewhat likely ☐ Refused/No Answer
☐ Very likely
21. What is the highest level of education in this household? (Hand them list, mark only one)
- ☐ 1 ☐ 6

- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 7
- ☐ 8
- ☐ 9 - Don't Know
- ☐ 10 - Refused/No Answer

22. What was your total household income last year, before taxes? (Hand them list) Let me know which category you fall into.
(Mark only one)

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8 - Don't Know
- ☐ 9 – Refused/No Answer

(Hand them larvacide and information. You may need to explain how to use it. Thank them for their time.)

Appendix 3 – Variables

	Question	Response Option	Variable Name
	Date	MM/DD/YY	Date
	Team Number	Alphanumeric	Team_ID
	Cluster Number	Alphanumeric/Prefilled	Cluster
	Survey Number	###	Survey
	Interviewer Initials	Alphanumeric	Interviewer
1	What language is spoken most often in your home?	1= English 2= Spanish 3= Other: _____ 4= Don't Know 99= Refused/No Answer	Language Language_txt
2	How many adults (18 years old or older) live in this household?	1= 1 2= 2 3= 3 4= 4 5= 5 or more 6 = 0 7= Don't Know 99= Refused/No Answer	Adults
3	How many adults are 65 or older?	1= 0 2= 1 3= 2 4= 3 5= 4 6 = 5 or more 7= Don't Know 99= Refused/No Answer	Adults_65
4	How many children (younger than 18 years old) live in this household? (Only include children who reside at the household 50% or more of the week.)	1= 0 2= 1 3= 2 4= 3 5= 4 6 = 5 or more 7= Don't Know 99= Refused/No Answer	Children
5	Have you or anyone in your household heard about Shawnee County's "Dump Day" Campaign? This campaign is meant to remind the public to empty standing water	1= Yes 2= No 3= Don't Know 99= Refused/No Answer	Dump_Day_Aware

	on their property every Friday from May through October.		
5a	How did your household hear about the "Dump Day" campaign? (Check all that apply)	1= Facebook 2= Twitter 3= From a friend/relative 4= News/radio 5= Shawnee County Fair 6= Other: _____ 7= Don't Know 99= Refused/No Answer	Dump_Day_Campaign Dump_Day_Campaign_txt
6	How does your household prefer to receive the majority of its health news? (Check all that apply. If more than one are mentioned, ask participant to rank up to 3. 1=Most preferred 3=Least preferred)	1= Internet 2= Television 3= Radio 4= Social Media 5= Newspaper 6= E-mail 7= Other: _____ 8= Don't Know 99= Refused/No Answer	Heatlh_News Health_News_txt
7	How often does your household seek out or pay attention to health news?	1= Daily 2= Weekly 3= Monthly 4= Quarterly 5= My household does not seek out or follow health news 6= Don't Know 99= Refused/No Answer	Heatlh_News_Freq
8	How many weeks between May 21, 2017 and September 15, 2017 (18 weeks) did you or a member of your household dump water on your property?	1= None 2= 1-4 Weeks 3= 5-8 Weeks 4= 9-12 Weeks 5= 12 or more weeks 6= Don't Know 99= Refused/No Answer	Dump_Weeks

8a	Did your household dump water in response to the “Dump Day” campaign?	1= No, was not aware of campaign 2= No, dumped water, not because of campaign 3= Yes, dumped water because of campaign 4= Don't Know 99= Refused/No Answer	Dump_Why
9	On average, how many times per week in the last 3 months have you or the members of your household used mosquito repellent?	1= Less than once a week 2= 1-2 times a week 3= 3-4 times a week 4= 5 or more times a week 5= Don't Know 99= Refused/No Answer	Mosquito_Repellent
10	On average, how many hours per week do you or the members of your household spend outdoors at your property?	1= Less than 1 hour 2= 1-4 hours 3= 4-8 hours 4= 8 or more hours 5= Don't Know 99= Refused/No Answer	Outdoor_Hours
11	What parts of day are you or the members of your household outdoors at your property?	1= Early morning (5:00 AM - 8:00 AM) 2= Late morning (8:00 AM - 12:00 PM) 3= Afternoon (12:00 PM - 4:00 PM) 4= Early Evening (4:00 PM - 7:00 PM) 5= Late Evening (7:00 PM - 11:00 PM) 6= Overnight (11:00 PM - 5:00 AM) 7= Don't Know 99= Refused/No Answer	Outdoor_Time_Of_Day_1 Outdoor_Time_Of_Day_2 Outdoor_Time_Of_Day_3 Outdoor_Time_Of_Day_4
12	Do you or other members of your household consider mosquitoes to be a nuisance around this property?	1= Yes 2= No, property has mosquitoes, not a nuisance 3= No, do not notice mosquitoes 4= Don't Know 99= Refused/No Answer	Mosquito_Nuisance

13	How important is mosquito control and prevention as a public health issue on your property to your household?	1= Not important at all 2= Somewhat important 3= Very important 4= Don't Know 99= Refused/No Answer	Mosquito_Control_PH
14	Is there standing water on your property that cannot be dumped (ex ditches, ponds without fish, etc.)?	1= Yes 2= No 3= Don't Know 99= Refused/No Answer	Standing_Water
15	Does your household use any product designed to kill mosquitoes on your property?	1= Yes 2= No 3= Don't Know 99= Refused/No Answer	Mosquito_Products
15a	What products does your household use?	1= Adulticide 2= Larvicide 3= Other:_____ 4= Both 99= Refused/No Answer	Household_Products
16	If your household was provided larvicide (product used in standing water that cannot be dumped to reduce mosquito breeding sites), would you or a member of your household use it on your property?	1= Yes 2= No 3= Don't Know 99= Refused/No Answer	Larvicide_Use
16a	Why not?	1= Harmful to health 2= Unnecessary 3= Other:_____ 4= Don't Know 99= Refused/No Answer	Larvicide_Why_Not
17	What day(s) of the week would the Dump Day reminder be the most useful to remind your household to dump standing water on your property?	1= Sunday 2= Monday 3= Tuesday 4= Wednesday 5= Thursday 6= Friday 7= Saturday 8= Don't Know 99= Refused/No Answer	Reminder_Day
18	Do you or does anyone in your household use the following social media platforms?	1= Facebook 2= Twitter 3= None 4= Don't Know 5= Both 99= Refused/No Answer	Social_Media_Use

18a	What social media platforms do you or any member of this household follow Shawnee County Health Department on?	1= Facebook 2= Twitter 3= None 4= Don't Know 5= Both 99= Refused/No Answer	Social_Media_HD_Follow
19	How interested are you in following the Shawnee County Health Department on any social media platform?	1= Not interested 2= Somewhat interested 3= Very interested 4= Don't Know 99= Refused/No Answer	Social_Media_HD_Interest
20	How likely are you or the members of your household to act on a public health recommendation, such as vaccinating your children, dumping standing water in your yard, or making sure your childcare is licensed from the Shawnee County Health Department?	1= Not likely 2= Somewhat likely 3= Very likely 4= Don't Know 99= Refused/No Answer	PH_Recommendations
21	What is the highest level of education in this household?	1= Less than 9th grade 2= 9-12th grade, no diploma 3= High school graduate 4= Associates or Vo-tech 5= Some college (no degree) 6= Bachelor's degree 7= Graduate or professional 8= Other: _____ 9= Don't Know 99= Refused/No Answer	Education
22	What was your total household income last year, before taxes?	1= Less than \$14,999 2= \$15,000 to \$24,999 3= \$25,000 to \$34,999 4= \$35,000 to \$49,999 5= \$50,000 to \$74,999 6= \$75,000 to \$99,999 7= \$100,000 or more 8= Don't Know 99= Refused/No Answer	Income